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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/052,703	01/16/2002	Sang-Bom Kang	9898-207	1366
20575	7590	11/28/2007		
MARGER JOHNSON & MCCOLLOM, P.C. 210 SW MORRISON STREET, SUITE 400 PORTLAND, OR 97204			EXAMINER ZERVIGON, RUDY	
			ART UNIT 1792	PAPER NUMBER
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/052,703	KANG ET AL.	
	Examiner	Art Unit	
	Rudy Zervigon	1792	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 16 April 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 2-8, 11-19, 21-27, 32-37 and 41-43 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 2-8, 11-19, 21-27, 32-37 and 41-43 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### *Claim Objections*

1. Claims 2-8, 11-19, 21-26 objected to because of the following informalities: The objected claims have independent claim numbers that are larger than some dependent claim numbers. Appropriate correction is required.

### *Claim Rejections - 35 USC § 103*

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
3. Claims 2-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horie; Kuniaki et al. (US 6132512 A). Horie teaches:
  - i. Horie teaches a shower head (5; Figure 7; 20; Figure 10,12b; column 10, lines 21-43) for supplying a reaction gas to a wafer (W; Figure 7) in a process chamber (1; Figure 7; column 7, lines 1-40), the shower head (5; Figure 7; 20; Figure 10,12b; column 10, lines 21-43) comprising circular plates (31,32; Figure 12b; column 11, lines 4-40), each of the circular plates (31,32; Figure 12b; column 11, lines 4-40) arranged substantially parallel to each other in a vertically stacked arrangement, each of the circular plates (31,32; Figure 12b; column 11, lines 4-40) having substantially the same diameter, each of the circular plates (31,32; Figure 12b; column 11, lines 4-40) including gas paths ("C"; Figure 12b; 24; Figure 10) for supplying a reaction gas to the process chamber (1; Figure 7; column 7, lines 1-40), a first outer cooling line (D1; Figure 10; column 10, lines 21-45) arranged outside the lower (32; Figure 12b; column 11, lines 4-40) one of the circular plates (31,32; Figure 12b; column 11, lines 4-40) connecting the coolant inlets

- (25b1,b2,b3; Figure 10; column 10, lines 21-45); and a second outer cooling line (D2; Figure 10; column 10, lines 21-45) arranged outside the lower (32; Figure 12b; column 11, lines 4-40) one of the circular plates (31,32; Figure 12b; column 11, lines 4-40) connecting the coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) - claim 8. Applicant's claim requirement of "cooling" is a claim requirement of intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP 2111.02).
- ii. The shower head (5; Figure 7; 20; Figure 10, 12b; column 10, lines 21-43) of claim 8, the lower (32; Figure 12b; column 11, lines 4-40) one of the circular plates (31, 32; Figure 12b; column 11, lines 4-40) including a circumferential edge (25b, c1, b, c2, b, c3; Figure 10; column 10, lines 21-45) that consists of a first semicircular portion (25b1, b2, b3; Figure 10; column 10, lines 21-45) and a second semicircular portion (25c1, c2, c3; Figure 10; column 10, lines 21-45), the coolant inlets (25b1, b2, b3; Figure 10; column 10, lines 21-45) arranged along the first semicircular portion (25b1, b2, b3; Figure 10; column 10, lines 21-45), the coolant outlets (25c1, c2, c3; Figure 10; column 10, lines 21-45) arranged along the second semicircular portion (25c1, c2, c3; Figure 10; column 10, lines 21-45),

the cooling lines (B,B'; Figure 10; column 10, lines 21-45) arranged such that they are parallel to one another, as claimed by claim 4

- iii. the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) and coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) disposed along the circumferential edge (25b,c1,b,c2,b,c3; Figure 10; column 10, lines 21-45) of the lower (32; Figure 12b; column 11, lines 4-40) one of the circular plates (31,32; Figure 12b; column 11, lines 4-40) such that the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) and coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) are arranged in pairs consisting of one coolant inlet (25b1,b2,b3; Figure 10; column 10, lines 21-45) and one coolant outlet (25c1,c2,c3; Figure 10; column 10, lines 21-45), an angular spacing between the one coolant inlet (25b1,b2,b3; Figure 10; column 10, lines 21-45) and the one coolant outlet (25c1,c2,c3; Figure 10; column 10, lines 21-45) of each pair less than the angular spacing between the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) and an angular spacing between the coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) - claim 5

Horie does not teach:

- i. The shower head (5; Figure 7; 20; Figure 10,12b; column 10, lines 21-43) of claim 8, the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) and coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) disposed along a circumferential edge (25b,c1,b,c2,b,c3; Figure 10; column 10, lines 21-45) of the lower (32; Figure 12b; column 11, lines 4-40) one of the circular plates (31,32; Figure 12b; column 11, lines 4-40), the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) arranged such that

- each coolant inlet (25b1,b2,b3; Figure 10; column 10, lines 21-45) is separated from an adjacent coolant inlet (25b1,b2,b3; Figure 10; column 10, lines 21-45) by an angular spacing that is substantially equal to 360 degrees divided by a total number of coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45), the coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) arranged such that lines drawn from each of the outlets to a radial center of the lower (32; Figure 12b; column 11, lines 4-40) one of the circular plates (31,32; Figure 12b; column 11, lines 4-40) divide the lower (32; Figure 12b; column 11, lines 4-40) one of the circular plates (31,32; Figure 12b; column 11, lines 4-40) into substantially equal parts, as claimed by claim 2
- ii. The shower head (5; Figure 7; 20; Figure 10,12b; column 10, lines 21-43) of claim 2, the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) consisting of four coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45), the coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) consisting of four coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45), the cooling lines (B,B'; Figure 10; column 10, lines 21-45) consisting of four cooling lines (B,B'; Figure 10; column 10, lines 21-45), as claimed by claim 3
- iii. The shower head (5; Figure 7; 20; Figure 10,12b; column 10, lines 21-43) of claim 3, the four cooling lines (B,B'; Figure 10; column 10, lines 21-45) arranged such that a path of each of the four cooling lines (B,B'; Figure 10; column 10, lines 21-45) within the lower (32; Figure 12b; column 11, lines 4-40) one of the circular plates (31,32; Figure 12b; column 11, lines 4-40) forms two legs of a right triangle, as claimed by claim 6

- iv. The shower head (5; Figure 7; 20; Figure 10,12b; column 10, lines 21-43) of claim 8, the lower (32; Figure 12b; column 11, lines 4-40) one of the circular plates (31,32; Figure 12b; column 11, lines 4-40) including a circumferential edge (25b,c1,b,c2,b,c3; Figure 10; column 10, lines 21-45) that consists of a first semicircular portion (25b1,b2,b3; Figure 10; column 10, lines 21-45) and a second semicircular portion (25c1,c2,c3; Figure 10; column 10, lines 21-45), wherein a total number of coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) and a total number of coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) are both even numbers, half of the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) and half of the coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) arranged along the first semicircular portion (25b1,b2,b3; Figure 10; column 10, lines 21-45), the other half of the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) and the other half of the coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) arranged along the second semicircular portion (25c1,c2,c3; Figure 10; column 10, lines 21-45), the cooling lines (B,B'; Figure 10; column 10, lines 21-45) arranged such that they are parallel to one another, as claimed by claim 7
- v. cooling lines (B,B'; Figure 10; column 10, lines 21-45) arranged within a lower one of the circular plates (31,32; Figure 12b; column 11, lines 4-40); coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) arranged outside the lower one of the circular plates (31,32; Figure 12b; column 11, lines 4-40), wherein each coolant inlet (25b1,b2,b3; Figure 10; column 10, lines 21-45) is connected to only one cooling line (B,B'; Figure 10; column 10, lines 21-45); coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) arranged outside the lower one of the circular plates (31,32; Figure 12b; column 11,



lines 4-40), wherein each coolant outlet (25c1,c2,c3; Figure 10; column 10, lines 21-45)  
is connected to only one cooling line (B,B'; Figure 10; column 10, lines 21-45) - claim 8

It would have been obvious to one of ordinary skill in the art at the time the invention was made to reproduce Horie's coolant inlet and coolant outlet parts at optimized relative positions.

Motivation to reproduce Horie's coolant inlet and coolant outlet parts at optimized relative positions is to optimize the heat transfer of Horie's showerhead (5; Figure 7; 20; Figure 10,12b; column 10, lines 21-43) as taught by Horie (column 2; lines 38-54). Further, it is well established that the duplication of parts is obvious (In re Harza , 274 F.2d 669, 124 USPQ 378 (CCPA 1960) MPEP 2144.04). Additionally, it is well established that changes in apparatus dimensions are within the level of ordinary skill in the art.(Gardner v. TEC Systems, Inc. , 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied , 469 U.S. 830, 225 USPQ 232 (1984); In re Rose , 220 F.2d 459, 105 USPQ 237 (CCPA 1955); In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); See MPEP 2144.04).

4. Claims 11-19, 21-27, 32-37, and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horie; Kuniaki et al. (US 6132512 A) in view of Tomoyasu; Masayuki et al. (US 6544380 B2). Horie is discussed above. Horie further teaches:

- i. the heater stage (3,4; Figure 7; column 7, lines 1-40) configured to have an adjustable height (17, 18; Figure 7) within the process chamber (1; Figure 7; column 7, lines 1-40), a bottom of the heater stage (3,4; Figure 7; column 7, lines 1-40) configured to contact an upper surface of the separating device (not numbered; Figure 7 - elements immediately above 17) at a lower position of the heater stage (3,4; Figure 7; column 7, lines 1-40), wherein a position of the separating device (not numbered; Figure 7 - elements



- immediately above 17) remains fixed relative to the process chamber (1; Figure 7; column 7, lines 1-40) – claim 11
- ii. wherein the separating device (not numbered; Figure 7 - elements immediately above 17) is configured to separate the heater stage (3,4; Figure 7; column 7, lines 1-40) and the process chamber (1; Figure 7; column 7, lines 1-40) by a uniform distance – claim 12
- iii. The apparatus (Figure 7; column 7, lines 1-40) of claim 19, further comprising: a shaft (not numbered; Figure 7) installed beneath the heater stage (3,4; Figure 7; column 7, lines 1-40) and configured to raise and lower the heater stage (3,4; Figure 7; column 7, lines 1-40); and a shaft introduction portion (17, 18; Figure 7) configured to introduce the shaft (not numbered; Figure 7) at the bottom of the process chamber (1; Figure 7; column 7, lines 1-40), as claimed by claim 17
- iv. The apparatus (Figure 7; column 7, lines 1-40) of claim 27, the plurality of plates (31,32; Figure 12b; column 11, lines 4-40) substantially circular in shape and having substantially the same diameter, the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) and coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) disposed along a circumferential edge (25b,c1,b,c2,b,c3; Figure 10; column 10, lines 21-45) of the lower plate (32; Figure 12b; column 11, lines 4-40), the circumferential edge (25b,c1,b,c2,b,c3; Figure 10; column 10, lines 21-45) consisting of a first semicircular edge (25b1,b2,b3; Figure 10; column 10, lines 21-45) and a second semicircular edge (25c1,c2,c3; Figure 10; column 10, lines 21-45) that together form a circle, the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) disposed along the first semicircular edge (25b1,b2,b3; Figure 10; column 10, lines 21-45), the coolant outlets

(25c1,c2,c3; Figure 10; column 10, lines 21-45) disposed along the second semicircular edge (25c1,c2,c3; Figure 10; column 10, lines 21-45), and the inner cooling lines (B,B'; Figure 10; column 10, lines 21-45) disposed parallel to each other, as claimed by claim 23

- v. The apparatus (Figure 7; column 7, lines 1-40) of claim 21, the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) and coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) disposed along the circumferential edge (25b,c1,b,c2,b,c3; Figure 10; column 10, lines 21-45) of the lower plate (32; Figure 12b; column 11, lines 4-40) such that the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) and coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) are arranged in pairs consisting of one coolant inlet (25b1,b2,b3; Figure 10; column 10, lines 21-45) and one coolant outlet (25c1,c2,c3; Figure 10; column 10, lines 21-45), an angular spacing between the one coolant inlet (25b1,b2,b3; Figure 10; column 10, lines 21-45) and the one coolant outlet (25c1,c2,c3; Figure 10; column 10, lines 21-45) of each pair less than an angular spacing between the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) and an angular spacing between the coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45), as claimed by claim 24
- vi. The apparatus (Figure 7; column 7, lines 1-40) of claim 22, the four cooling lines (B,B'; Figure 10; column 10, lines 21-45) arranged such that a path of each of the four cooling lines (B,B'; Figure 10; column 10, lines 21-45) within the lower plate (32; Figure 12b; column 11, lines 4-40) consists of two straight lines that intersect at a right angle, as claimed by claim 25

- vii. The apparatus (Figure 7; column 7, lines 1-40) of claim 27, further comprising: a shaft (not numbered; Figure 7) configured to raise and lower the heater stage (3,4; Figure 7; column 7, lines 1-40), said shaft (not numbered; Figure 7) arranged beneath the heater stage (3,4; Figure 7; column 7, lines 1-40); and a shaft introduction portion (17, 18; Figure 7) configured to contain the shaft (not numbered; Figure 7) at the bottom of the process chamber (1; Figure 7; column 7, lines 1-40), as claimed by claim 35
- viii. the process chamber (1; Figure 7; column 7, lines 1-40) having a bottom wall (17, Figure 7; column 7, lines 1-40) that defines a lower boundary of the process chamber (1; Figure 7; column 7, lines 1-40), the separating device (not numbered; Figure 7 - elements immediately above 17) disposed such that a bottom surface of the separating device (not numbered; Figure 7 - elements immediately above 17) is in physical contact with the bottom wall (17, Figure 7; column 7, lines 1-40) of the process chamber (1; Figure 7; column 7, lines 1-40) – claim 41

Horie does not teach:

- i. An apparatus (Figure 7; column 7, lines 1-40) for forming a thin film, said apparatus (Figure 7; column 7, lines 1-40) comprising: a process chamber (1; Figure 7; column 7, lines 1-40) having a bottom wall (17, Figure 7; column 7, lines 1-40) that defines a lowermost boundary of the process chamber (1; Figure 7; column 7, lines 1-40); a heater stage (3,4; Figure 7; column 7, lines 1-40) disposed within the process chamber (1; Figure 7; column 7, lines 1-40) and entirely above the bottom wall (17, Figure 7; column 7, lines 1-40), the heater stage (3,4; Figure 7; column 7, lines 1-40) configured to support a wafer (W; Figure 7) and to heat the wafer (W; Figure 7) to a high temperature; a shower head

- (5; Figure 7; 20; Figure 10,12b; column 10, lines 21-43) disposed above the heater stage (3,4; Figure 7; column 7, lines 1-40), the shower head (5; Figure 7; 20; Figure 10,12b; column 10, lines 21-43) configured to supply a reaction gas to the wafer (W; Figure 7); a separating device (not numbered; Figure 7 - elements immediately above 17) disposed beneath the heater stage (3,4; Figure 7; column 7, lines 1-40), a lower surface of the separating device (not numbered; Figure 7 - elements immediately above 17) disposed in contact with the bottom wall (17, Figure 7; column 7, lines 1-40), the separating device (not numbered; Figure 7 - elements immediately above 17) configured to separate the heater stage (3,4; Figure 7; column 7, lines 1-40) from the bottom wall (17, Figure 7; column 7, lines 1-40) and to reduce a volume of processing space within the process chamber (1; Figure 7; column 7, lines 1-40); and a process chamber (1; Figure 7; column 7, lines 1-40) cooling system configured to cool a bottom surface of the process chamber (1; Figure 7; column 7, lines 1-40) whereon the separating device (not numbered; Figure 7 - elements immediately above 17) is located, as claimed by claim 19
- ii. The apparatus (Figure 7; column 7, lines 1-40) of claim 12, wherein the heater stage (3,4; Figure 7; column 7, lines 1-40) and the process chamber (1; Figure 7; column 7, lines 1-40) are separated by about 2 to about 10 cm, as claimed by claim 13
- iii. The apparatus (Figure 7; column 7, lines 1-40) of claim 19, wherein the separating device (not numbered; Figure 7 - elements immediately above 17) comprises a heat-resistant material, as claimed by claim 14
- iv. The apparatus (Figure 7; column 7, lines 1-40) of claim 14, wherein the heat-resistant material is a ceramic material, as claimed by claim 15

- v. The apparatus (Figure 7; column 7, lines 1-40) of claim 11, wherein the separating device (not numbered; Figure 7 - elements immediately above 17) is ring shaped, the upper surface of the separating device (not numbered; Figure 7 - elements immediately above 17) configured to abut a lower surface of the heater stage (3,4; Figure 7; column 7, lines 1-40), a substantial portion of the upper surface of the separating device (not numbered; Figure 7 - elements immediately above 17) disposed directly beneath the lower surface of the heater stage (3,4; Figure 7; column 7, lines 1-40), as claimed by claim 16
- vi. The apparatus (Figure 7; column 7, lines 1-40) of claim 17, wherein the shaft introduction portion (17, 18; Figure 7) is formed as a flexible bellows and has a length that varies as the shaft (not numbered; Figure 7) is raised and lowered, as claimed by claim 18
- vii. An apparatus (Figure 7; column 7, lines 1-40) for forming a thin film, said apparatus (Figure 7; column 7, lines 1-40) comprising: a process chamber (1; Figure 7; column 7, lines 1-40); a heater stage (3,4; Figure 7; column 7, lines 1-40) arranged in a lower (32; Figure 12b; column 11, lines 4-40) portion of the process chamber (1; Figure 7; column 7, lines 1-40) and configured to support a wafer (W; Figure 7) and to heat the wafer (W; Figure 7) to a high temperature; a shower head (5; Figure 7; 20; Figure 10,12b; column 10, lines 21-43) disposed in an upper portion of the process chamber (1; Figure 7; column 7, lines 1-40) and configured to supplying a reaction gas to the wafer (W; Figure 7), said shower head (5; Figure 7; 20; Figure 10,12b; column 10, lines 21-43) comprising a plurality of plates (31,32; Figure 12b; column 11, lines 4-40) having a plurality of gas paths ("C"; Figure 12b; 24; Figure 10) formed therein and a shower head (5; Figure 7; 20; Figure 10,12b; column 10, lines 21-43) cooling system arranged in a lower plate (32;

Figure 12b; column 11, lines 4-40); said cooling system comprising a plurality of coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45), a plurality of coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45), and a plurality of independent inner cooling lines (B,B'; Figure 10; column 10, lines 21-45) for connecting each of the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) to one of the coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45); and a separating device (not numbered; Figure 7 - elements immediately above 17) arranged between the process chamber (1; Figure 7; column 7, lines 1-40) and the heater stage (3,4; Figure 7; column 7, lines 1-40), the separating device (not numbered; Figure 7 - elements immediately above 17) arranged to separate the heater stage (3,4; Figure 7; column 7, lines 1-40) and a bottom of the process chamber (1; Figure 7; column 7, lines 1-40) by a substantially uniform amount, the substantially uniform amount in the range of about 2 to about 10 cm a first outer cooling line (D1; Figure 10; column 10, lines 21-45) located outside the lower plate (32; Figure 12b; column 11, lines 4-40) and configured to connect the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45); and a second outer cooling line (D2; Figure 10; column 10, lines 21-45) located outside the lower plate (32; Figure 12b; column 11, lines 4-40) and configured to connect the coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45), as claimed by claim 27

- viii. The apparatus (Figure 7; column 7, lines 1-40) of claim 27, the plurality of plates (31,32; Figure 12b; column 11, lines 4-40) substantially circular in shape and having substantially the same diameter, the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) and coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) disposed

along a circumferential edge (25b,c1,b,c2,b,c3; Figure 10; column 10, lines 21-45) of the lower plate (32; Figure 12b; column 11, lines 4-40), the coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) arranged such that each coolant outlet (25c1,c2,c3; Figure 10; column 10, lines 21-45) is separated from a nearest adjacent coolant outlet (25c1,c2,c3; Figure 10; column 10, lines 21-45) by an angular spacing that is substantially equal to 360 degrees divided by a total number of coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45), the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) arranged such that lines drawn from each of the inlets to a radial center of the lower-most plate divide the lower plate (32; Figure 12b; column 11, lines 4-40) into substantially equal parts, as claimed by claim 21

- ix. The apparatus (Figure 7; column 7, lines 1-40) of claim 21, the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) consisting of four coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45), the coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) consisting of four coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45), and the inner cooling lines (B,B'; Figure 10; column 10, lines 21-45) consisting of four inner cooling lines (B,B'; Figure 10; column 10, lines 21-45), as claimed by claim 22
- x. The apparatus (Figure 7; column 7, lines 1-40) of claim 27, the lower plate (32; Figure 12b; column 11, lines 4-40) having a substantially circular shape, the lower plate (32; Figure 12b; column 11, lines 4-40) including a circumferential edge (25b,c1,b,c2,b,c3; Figure 10; column 10, lines 21-45) that consists of a first semicircular portion (25b1,b2,b3; Figure 10; column 10, lines 21-45) and a second semicircular portion



- (25c1,c2,c3; Figure 10; column 10, lines 21-45), wherein a total number of coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) and a total number of coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) are both even numbers, half of the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) and half of the coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) are alternately arranged along the first semicircular portion (25b1,b2,b3; Figure 10; column 10, lines 21-45), the other half of the coolant inlets (25b1,b2,b3; Figure 10; column 10, lines 21-45) and the other half of the coolant outlets (25c1,c2,c3; Figure 10; column 10, lines 21-45) are alternately arranged along the second semicircular portion (25c1,c2,c3; Figure 10; column 10, lines 21-45), and the cooling lines (B,B'; Figure 10; column 10, lines 21-45) are arranged such that they are parallel to one another, as claimed by claim 26
- xi. The apparatus (Figure 7; column 7, lines 1-40) of claim 27, wherein the separating device (not numbered; Figure 7 - elements immediately above 17) is formed of a heat-resistant material, as claimed by claim 32
- xii. The apparatus (Figure 7; column 7, lines 1-40) of claim 32, wherein the heat-resistant material is a ceramic material, as claimed by claim 33
- xiii. The apparatus (Figure 7; column 7, lines 1-40) of claim 27, wherein the separating device (not numbered; Figure 7 - elements immediately above 17) is ring shaped and is configured to abut a bottom surface of the heater stage (3,4; Figure 7; column 7, lines 1-40), as claimed by claim 34
- xiv. The apparatus (Figure 7; column 7, lines 1-40) of claim 35, wherein the shaft introduction portion (17, 18; Figure 7) comprises a flexible bellows wall having a variable length

depending on the raising and lower (32; Figure 12b; column 11, lines 4-40)ing of the shaft (not numbered; Figure 7), as claimed by claim 36

- xv. The apparatus (Figure 7; column 7, lines 1-40) of claim 27, further comprising a process chamber (1; Figure 7; column 7, lines 1-40) cooling system arranged in thermal communication with a lower (32; Figure 12b; column 11, lines 4-40) portion of the process chamber (1; Figure 7; column 7, lines 1-40), said lower (32; Figure 12b; column 11, lines 4-40) portion of the process chamber (1; Figure 7; column 7, lines 1-40) supporting the separating device (not numbered; Figure 7 - elements immediately above 17), as claimed by claim 37

Tomoyasu teaches a wafer processing apparatus (Figure 18) including:

- i. a separating device (527; Figure 18) disposed beneath the heater stage (526; Figure 18), a lower surface of the separating device (527; Figure 18) disposed in contact with the bottom wall (546; Figure 18), the separating device (527; Figure 18) configured to separate the heater stage (526; Figure 18) from the bottom wall (546; Figure 18) and to reduce a volume of processing space within the process chamber (502; Figure 18); and a process chamber (502; Figure 18) cooling system (521; Figure 18) configured to cool a bottom surface of the process chamber (502; Figure 18) whereon the separating device (527; Figure 18) is located - claim 19
- ii. The apparatus (Figure 7; column 7, lines 1-40) of claim 19, wherein the separating device (527; Figure 18) comprises a heat-resistant material ("heat insulating wall"; column 14; lines 13-21) - claim 14

- iii. the separating device (527; Figure 18) is ring shaped, the upper surface of the separating device (527; Figure 18) configured to abut a lower surface of the heater stage (526; Figure 18), a substantial portion of the upper surface of the separating device (527; Figure 18) disposed directly beneath the lower surface of the heater stage (526; Figure 18) - claim 16
- iv. a shaft introduction portion (544, 547; Figure 18) is formed as a flexible bellows (547; Figure 18) and has a length that varies as the shaft (544; Figure 18) is raised and lowered - claim 18
- v. the separating device (527; Figure 18) is ring shaped and is configured to abut a bottom surface of the heater stage (526; Figure 18) - claim 34
- vi. the shaft introduction portion (544, 547; Figure 18) comprises a flexible bellows (547; Figure 18) wall having a variable length depending on the raising and lower (32; Figure 12b; column 11, lines 4-40)ing of the shaft (544; Figure 18) - claim 36
- vii. a process chamber (502; Figure 18) cooling system (521; Figure 18) arranged in thermal communication with a lower portion of the process chamber (502; Figure 18), said lower portion of the process chamber (502; Figure 18) supporting the separating device (527; Figure 18), as claimed by claim 37

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace Horie's lifting mechanism (17,18; Figure 7) with Tomoyasu's lifting mechanism (544, 547; Figure 18) and adding Tomoyasu's cooling system (521; Figure 18). Further it would have been obvious to one of ordinary skill in the art at the time the invention was made to reproduce

Horie's coolant inlet and coolant outlet parts at optimized relative positions, inclusive, to use ceramic material parts.

Motivation to replace Horie's lifting mechanism (17,18; Figure 7) with Tomoyasu's lifting mechanism (544, 547; Figure 18) and adding Tomoyasu's cooling system (521; Figure 18) is for influencing wafer temperature control as taught by Tomoyasu (column 10; lines 50-62). Further it would have been obvious to one of ordinary skill in the art at the time the invention was made to reproduce Horie's coolant inlet and coolant outlet parts at optimized relative positions, inclusive, to use ceramic material parts as taught by Tomoyasu (column 10; lines 50-62 – "aluminum nitride"). Further, it is well established that the duplication of parts is obvious (In re Harza , 274 F.2d 669, 124 USPQ 378 (CCPA 1960) MPEP 2144.04). Additionally, it is well established that changes in apparatus dimensions are within the level of ordinary skill in the art.(Gardner v. TEC Systems, Inc. , 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied , 469 U.S. 830, 225 USPQ 232 (1984); In re Rose , 220 F.2d 459, 105 USPQ 237 (CCPA 1955); In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); See MPEP 2144.04).

5. Claims 42 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horie; Kuniaki et al. (US 6132512 A) and Tomoyasu; Masayuki et al. (US 6544380 B2) in view of Chen; Lee et al. (US 4534816 A). Horie and Tomoyasu are discussed above. Horie further teaches Horie's separating device (not numbered; Figure 7 - elements immediately above 17) is disposed inside the process chamber. Horie and Tomoyasu do not teach:

- i. The apparatus of claim 19, wherein the process chamber (502; Figure 18) cooling system (521; Figure 18) is disposed outside the process chamber, as claimed by claim 42

- ii. the process chamber cooling system (521; Figure 18) is disposed outside the process chamber (502; Figure 18), as claimed by claim 43

Chen teaches a similar wafer processing apparatus (Figure 1) including a cooling system (40) located outside of the process chamber (10).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have added an additional cooling plate to the apparatus of Tomoyasu.

Motivation to have added an additional cooling plate to the apparatus of Tomoyasu is for increasing temperature control.

#### *Response to Arguments*

6. Applicant's arguments filed April 16, 2007 have been fully considered but they are not persuasive.

7. Applicant's arguments with respect to claims 4 and 8 have been considered but are moot in view of the new grounds of rejection.

8. Applicant states with respect to claim 19:

“

Applicants respectfully submit, however, that the “separating device 527” of Tomoyasu (i.e., a heat insulating wall) is not disposed beneath the “heater stage 526”, is not disposed in contact with the bottom wall 546” (i.e., a support plate) and is not configured to separate the heater 526 from the support plate 546. As is clearly shown in FIG. 18, the heat insulating wall 527 is disposed laterally adjacent to the heater 526 and a wafer-mounted stage 525..

“

In response, the Examiner notes that his citation of Horie, not Tomoyasu, for teaching a separating device (not numbered; Figure 7 - elements immediately above 17) disposed beneath the heater stage (3,4; Figure 7; column 7, lines 1-40) is the applied reading in the claim limitation.

9. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, there is teaching, suggestion, and motivation to combine the references and in the knowledge generally available to one of ordinary skill in the art. Specifically, motivation to replace Horie's lifting mechanism (17,18; Figure 7) with Tomoyasu's lifting mechanism (544, 547; Figure 18) and adding Tomoyasu's cooling system (521; Figure 18) is for influencing wafer temperature control as taught by Tomoyasu (column 10; lines 50-62).

10. Applicant states:

“

Applicants respectfully submit however, that the unnumbered item shown in FIG. 7 of Horie, immediately above table 17 is not described in the specification of Horie. Moreover, FIG. 7 of Horie does not illustrate wherein the aforementioned unnumbered item is disposed directly vertically beneath the substrate holder 3. Accordingly, Horie cannot teach or even suggest wherein "the heater stage (3,4...) [is] configured to contact an upper surface of the separating

device (not numbered...) at a lower position of the heater stage" as asserted in the Office Action. Tomoyasu does not contain any teaching that cure this deficiency of Horie. For at least these additional reasons, Applicants respectfully submit that the combination of Horie in view of Yomoyasu fails to teach or suggest each and every element recited in claim 11 and, therefore, fails to render claim 11 obvious. See M.P.E.P. § 2143.03

“

In response, drawings can be used as prior art. Drawings and pictures can anticipate claims if they clearly show the structure which is claimed. In re Marz , 173 USPQ 25 (CCPA 1972). However, the picture must show all the claimed structural features and how they are put together. Jockmus v. Leviton , 28 F.2d 812 (2d Cir. 1928). The origin of the drawing is immaterial. For instance, drawings in a design patent can anticipate or make obvious the claimed invention as can drawings in utility patents. When the reference is a utility patent, it does not matter that the feature shown is unintended or unexplained in the specification. The drawings must be evaluated for what they reasonably disclose and suggest to one of ordinary skill in the art. In re Aslanian, 200 USPQ 500 (CCPA 1979). See MPEP § 2121.04 for more information on prior art drawings as "enabled disclosures."

### *Conclusion*

11. Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO**



MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272-1442. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official fax phone number for the 1763 art unit is (571) 273-8300. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner can not be reached please contact the examiner's supervisor, Parviz Hassanzadeh, at (571) 272-1435.

